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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/753,433	01/02/2001	John David Westwood	SJO990037US1	3544

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EXAMINER

MCDONALD, RODNEY GLENN

ART UNIT

PAPER NUMBER

1753

DATE MAILED: 03/17/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.
09/753,433

Applicant(s)
Westwood

Examiner
Rodney McDonald

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1753



-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136 (a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on Jan 10, 2003
- 2a) ☐ This action is FINAL. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11; 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-40 is/are pending in the application.
- 4a) Of the above, claim(s) 1-18 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 19-28, 30, and 31 is/are rejected.
- 7) ☒ Claim(s) 29 and 32-40 is/are objected to.
- 8) ☐ Claims _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgement is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
*See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. § 119(e).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgement is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892) 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) ☐ Notice of Informal Patent Application (PTO-152)
- 3) ☒ Information Disclosure Statement(s) (PTO-1449) Paper No(s). 2 6) ☐ Other: _____

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DETAILED ACTION

Election/Restriction

1. Claims 1-18 withdrawn from further consideration pursuant to 37 CFR 1.142(b) as being drawn to a nonelected invention, there being no allowable generic or linking claim. Election was made without traverse in Paper No. 4.
2. The Examiner withdraws the restriction requirement of December 12, 2002 but maintains the restriction requirement of October 12, 2002. The Applicant in response to the restriction requirement of October 12, 2002 elected without traverse Group II Claims 19-40 which are under examination.

Claim Rejections - 35 USC § 112

3. Claim 27 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 27 is indefinite because it is unclear at what pressure the process is occurring. The units have been omitted from the claim.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person

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having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103© and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

5. Claims 19, 20 and 23-27 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hiramoto et al. (U.S. Pat. 6,110,609) in view of Katsuragawa (U.S. Pat. 5,112,701).

Hiramoto et al. teach a magnetic thin film in which the crystal orientations are oriented in a predetermined direction, the axis of hard magnetization of each magnetic crystal grain caused by the crystal magnetic anisotropy has an orientation. (Column 4 lines 45-48) In Fig. 2 a head including magnetic thin films 16 and insulating layers 17 are laminated so as to form a multi-layered member. (Column 7 lines 58-62)

The magnetic thin film of the present invention can be realized by any techniques that have been conventionally used, such as an electrodeposition technique, a super-rapid cooling method and *a vapor deposition method*. However, when a desired thickness of a film is in the range from several *tens of nanometers to several micrometers (Compare to Applicant's required thicknesses)*, *it is preferable to produce the film by a vapor deposition method in a*

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low pressure atmosphere. As for the vapor deposition method, sputtering methods such as high frequency magnetron sputtering (RF sputtering method), direct current magnetron sputtering (DC sputtering, opposed-target sputtering, and ion beam sputtering are preferable. Especially, *the use of DC magnetron sputtering makes it easy to obtain a material exhibiting excellent soft magnetic characteristics immediately after formation of a film even if the substrate temperature is room temperature or less.*

In order *to form the magnetic thin film* of the present invention *by sputtering*, first, a composition of the magnetic thin film is determined in view of the saturation magnetic flux density, the soft magnetic characteristics, the value of resistance of a magnetic material, the corrosion resistance or the like. Then, *the composition of a sputtering target is determined (Compare to target composition of Applicant's claims. Composition is taught to be selected)* in view of a discrepancy in the composition. *Then, a magnetic thin film is formed by sputtering an alloy target on a substrate in an inert gas.* Alternatively, a magnetic thin film is formed by simultaneously sputtering a metal target and additional element pellets that are arranged on the metal target. *Alternatively, a magnetic thin film is formed by introducing a part of an additional substance in a gas state into an apparatus and performing reactive sputtering.*

When the discharge gas pressure, the discharge power, the temperature of the substrate, *the bias state of the substrate*, the magnetic field value above the target or in the vicinity of the substrate, the shape of the target or the direction in which the particles are incident to *the substrate is changed*, not only the structure of the magnetic thin film of the present invention, but also the

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apparent coefficient of thermal expansion, *the magnetic characteristics of the film or the like can be controlled (Compare to controlling the bias to be zero).*

Furthermore, when it is necessary further to raise the magnetic anisotropy of the magnetic thin film of the present invention, a heat treatment in the magnetic field or formation of a film in the magnetic field can be preformed as well (Column 9 lines 5-9)

Magnetic films can be formed with an alloy target with *a gas pressure of 1 to 4 mTorr (Compare to Applicant's pressures), a nitrogen flow rate of 2%-4% (Compare to Applicant's required nitrogen amount), an oxygen flow rate of 0%-2%* and a main sputtering gas of argon. (Column 9 lines 49-68; Column 10 lines 1-6)

Multi-layers structures can exist as magnetic layer/underlying layer/ Al_2O_3 layer/magnetic layer/underlying layer/ Al_2O_3 layer/substrate. (Column 17 lines 36-44)

The difference between Hiramoto et al. and the present claims is that depositing a film of NiFeCo-ON or NiFeCoN for the magnetic film is not discussed.

Katsuragawa teach a thin magnetic film comprising as a main ingredient nitrides of metal (Fe, Co, and Ni) (See abstract)

Katsuragawa teach a C-axis oriented thin magnetic film comprising as the main ingredient nitrides of at least one metal selected from Fe, Co and Ni. (Column 3 lines 8-10) It is preferred to make nitrogen into plasma and to collide against a target comprising metal atoms of at least one selected from Fe, Co, Ni, alloys thereof, nitrides and/or fluorides thereof. (Column 3 lines 65-68) It is also preferred to use argon made into plasma together with nitrogen in the form of plasma.

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(Column 4 lines 2-4) Magnetic films of nitride-oxygen mixture can be formed by irradiating ionized oxygen-containing nitrogen gases (argon is preferably added) to a target material. (Column 8 lines 21-25)

The motivation for utilizing magnetic films of NiFeCo-ON or NiFeCoN is that it allows production of films with a perpendicular magnetic anisotropy of not less than 4 KOe. (Column 3 lines 14-16)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have modified Hiramoto et al. by utilizing films of NiFeCo-ON or NiFeCoN as taught by Katsurgawa because it allows production of films with a perpendicular magnetic anisotropy of not less than 4 KOe.

6. Claims 21, 22, 28, 30 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Hiramoto et al. in view of Katsuragawa as applied to claims 19, 20 and 23-27 above, and further in view of Sano et al. (U.S. Pat. 5,503,943).

The differences not yet discussed is the use of N₂O (nitrous oxide) as the reactive gas and the amount of nitrous oxide utilized.

Sano et al. teach forming magnetic films during vapor deposition utilizing as an oxidizable gas oxygen, nitrous oxide, ozone, or a gas mixture containing an inert gas such as argon, nitrogen, etc. mixed therewith can be used, desirably a gas mixture of oxygen with argon or nitrogen. (Column 3 lines 43-48)

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The motivation for utilizing nitrous oxide is that it oxidizes the depositing film.

(Column 3 lines 43-48)

As to the amount of nitrous oxide it is believed that since Hiramoto et al. teach the required amount of nitrogen and oxygen to be utilized that the amount of nitrous oxide could be determined based on the required amounts of nitrogen and oxygen taught by Hiramoto et al. (See Hiramoto et al. discussed above)

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to have utilized nitrous oxide as taught by Sano et al. because it allows for oxidizing the film.

Allowable Subject Matter

7. Claims 29, 32-40 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

8. The following is a statement of reasons for the indication of allowable subject matter:

Claim 29 is indicated as being allowable because the prior art of record does not teach hard axis annealing the magnetic layer at about 232 °C in the presence of a magnetic field perpendicular to a major plane of the magnetic layer for about 400 minutes; and after said hard axis annealing, the magnetic layer having an H_k from 2.6 Oe to 6.0 Oe and in plane anisotropy.

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Claims 32-40 are indicated as being allowable because the prior art of record does not teach that before sputtering that target, sputter depositing a seed layer of NiFeCo-O-N with a second process gas that has a higher N₂O content than the first process gas.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Rodney McDonlad whose telephone number is 703-308-3807. The examiner can normally be reached on M-Th from 8 to 5:30. The examiner can also be reached on alternate Fridays.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Nam X. Nguyen, can be reached on (703) 308-3322. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9310.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-308-0661.



RODNEY G. McDONALD
PRIMARY EXAMINER

RM

March 11, 2003